DOCUMENT RESUME

ED 169 131 TM 008 697

AUTHOR Mathews, John J.; And Others
TITLE Prediction of Reading Grade Levels of Service Applicants from Armed Services Vocational Aptitude Battery (ASVAB). Interim Report for Period 1 April 1977 - 1 August 1978.
INSTITUTION Air Force Human Resources Lab., Brooks AFB, Texas.
REPORT NO AFHRL-TR-78-82
PUB DATE Dec 78
NOTE 16p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Mastery Tests; *Military Personnel; Postsecondary Education; *Predictive Ability (Testing); Reading Ability; *Reading Level; *Reading Tests
IDENTIFIERS *Armed Services Vocational Aptitude Battery; Gates MacGinitie Reading Test; Nelson Denny Reading Test

ABSTRACT

To assess the reading ability of military service applicants and accessions, and to determine the relationship between Armed Services Vocational Aptitude Battery (ASVAB) measures and reading scores, 2,432 subjects were given the Gates MacGinitie reading test and a subsample of 818 were given the Nelson-Denny reading test. The median reading grade level for service applicants was 9.0 based on Gates-MacGinitie and 9.5 based on Nelson-Denny. The median Gates-MacGinitie reading grade level of applicants who qualified for services was 10.2 compared to 5.7 for non-qualified applicants. The Armed Forces Qualification Test of the ASVAB correlated .76 with the average of reading grade levels for the two reading tests; the ASVAB General Technical (GT) composite (General Aptitude Index used by the Air Force) correlated .79. Finally, multiple correlations between the three ASVAB measures (work knowledge, general science, and numeric operations); the two reading tests; and average reading grade levels were .80, .77, and .86 respectively. It was recommended that the GT composite be used as an index of reading grade level. (Author/CP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED169131

AFHRL-TR-78-82

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SCOPE OF INTEREST NOTICE
The ERIC Facility has assigned this document for processing to: TM CS

In our judgement, this document is also of interest to the clearinghouses noted to the right. Indexing should reflect their special points of view.

AIR FORCE HUMAN RESOURCES LABORATORY

PREDICTION OF READING GRADE LEVELS OF SERVICE APPLICANTS FROM ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)

By

John J. Mathews
Lonnie D. Valentine, Jr.

PERSONNEL RESEARCH DIVISION
Brooks Air Force Base, Texas 78235

Wayne S. Sellman, Major, USAF

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
(Manpower, Reserve Affairs, and Logistics)
The Pentagon
Washington, D.C. 20301

December 1978

Interim Report for Period April 1977 – August 1978

Approved for public release; distribution unlimited.

TM008 697

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

NOTICE

When U.S. Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This interim report was submitted by Personnel Research Division, under project 7719, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235. Mr. John J. Mathews (PES) was the Principal Investigator for the Laboratory.

This report has been reviewed and cleared for open publication and/or public release by the appropriate Office of Information (OI) in accordance with AFR 190-17 and DoDD 5230.9. There is no objection to unlimited distribution of this report to the public at large, or by DDC to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved for publication.

LELAND D. BROKAW, Technical Director
Personnel Research Division

RONALD W. TERRY, Colonel, USAF
Commander

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER AFHRL-TR-78-82	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE *(and Subtitle)* PREDICTION OF READING GRADE LEVELS OF SERVICE APPLICANTS FROM ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)	5. TYPE OF REPORT & PERIOD COVERED Interim 1 April 1977 – 1 August 1978
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) John J. Mathews Lonnie D. Valentine, Jr. Wayne S. Sellman	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Personnel Research Division Air Force Human Resources Laboratory Brooks Air Force Base, Texas 78235	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62703F 77191225
11. CONTROLLING OFFICE NAME AND ADDRESS HQ Air Force Human Resources Laboratory (AFSC) Brooks Air Force Base, Texas 78235	12. REPORT DATE December 1978
	13. NUMBER OF PAGES 16
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*	15. SECURITY CLASS. *(of this report)* Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

SM Study Nr: 6851

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Armed Services Vocational Aptitude Battery (ASVAB)
selection instrument
literacy
psychological testing
reading
reading grade level

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The objectives of this study were to assess reading ability of military service applicants and accessions and to determine the relationship between ASVAB measures and reading scores. Data were collected at Armed Forces Examining and Entrance Stations. This report concerns 2,432 subjects given the Gates-MacGinitie reading test and a subsample given the Nelson-Denny reading test. The median reading grade level for service applicants was 9.0 based on Gates-MacGinitie and 9.5 based on Nelson-Denny. The median Gates-MacGinitie reading grade level of applicants who qualified for services was 10.2 compared to 5.7 for non-qualified applicants. The Armed Forces Qualification Test correlated .76 with the average of reading grade levels for the two reading tests. The ASVAB General Technical (GT) composite (General Aptitude Index (AI) for Air Force) correlated .79 with average reading grade level. It was

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

Item 20 Continued:

recommended that GT be used as an index of reading grade level for service applicants.

PREFACE

This research was conducted under Project 7719, Air Force Development of Selection, Assignment, Performance Evaluation, Retention and Utilization Devices; Task 771912, Air Force Selection and Classification Programs. Work unit 77191225 was established in response to Requirement for Personnel Research (RPR 76-25) submitted by the Air Force Manpower and Personnel Center (AFMPC/MPCYP) – Maj W. S. Sellman and Mr. R. W. Quick, HQ USAF/MPPE, Requirements Managers – entitled "Development, Validation, and Standardization of a Reading Ability Test for Air Force Personnel."

The substantial contributions of the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) in coordinating this study, the US Military Enlistment Processing Command (MEPCOM) in test administration, and especially A1C Richard Walker and Mr. Henry Clark of the Computational Sciences Division, Air Force Human Resources Laboratory, in data analysis are greatly appreciated.

TABLE OF CONTENTS

		Page
I.	Background	5
II.	Introduction	5
III.	Method	6
	Subjects	6
	Predictors	6
	Criteria	6
	Statistical Method	6
IV.	Results and Discussion	6
V.	Conclusions	11
VI.	Recommendations	11
References		11
Appendix A: Frequency Distributions of Variables for Gates-MacGinitie Sample (N = 2,033) and Nelson-Denny Subsample (N = 818)		13
Appendix B: Percentages of Applicants at Each Gates-MacGinitie Reading Grade Level by Race and Sex		14

LIST OF TABLES

Table		Page
1	Percentages of Qualified and Not Qualified Applicants by Service at Each Gates-MacGinitie Reading Grade Level	7
2	Percentage of High School Graduates and Non-Graduates at Each Gates-MacGinitie Reading Grade Level by Qualified/Non-Qualified	7
3	Comparison of Reading Grade Level and AFQT for Gates-MacGinitie (N = 2,033) and Nelson-Denny (N = 818) Samples	8
4	Means, Standard Deviations, and Intercorrelations of Variables for Gates-MacGinitie + Nelson-Denny Subsample	9

PREDICTION OF READING GRADE LEVELS OF SERVICE APPLICANTS FROM ARMED SERVICES VOCATIONAL APTITUDE BATTERY (ASVAB)

I. BACKGROUND

The General Accounting Office (GAO) submitted a report dated 31 March 1977 to the Secretary of Defense entitled "A Need to Address Illiteracy Problems in the Military Services." Among other things, it recommended that the Department of Defense develop a policy to address the illiteracy problem and have the Services (a) determine the reading grade level required for each military occupation and (b) establish an overall minimum reading level required for enlistment.

In a 10 June 1977 letter to the GAO, the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) concurred in general with the findings of the report (i.e., illiterate service personnel do have higher discharge rates, do experience more difficulty in training, and do have less potential for career advancement) but indicated that the DOD mission did not include the societal responsibility for remedying any deficiencies in the American educational system. Subsequent to the 10 June 1977 letter, other initiatives surfaced which were directly related to the illiteracy problem. The House and Senate Defense Appropriations Committees expressed concern about in-service high school completion programs and the potential impact of continuing to attempt to correct educational deficiencies of enlistees after they enter the Service. The Committees believed instead that a more efficient approach would be for potential enlistees with educational weaknesses to receive basic skills training prior to enlistment. Accordingly, the Secretaries of Health, Education, and Welfare (HEW) and Labor, in coordination with the Secretary of Defense, were requested to develop such a basic skills program.

II. INTRODUCTION

The result of these initiatives was increased emphasis by the Secretary of Defense on the Services' literacy programs. In that regard the Principal Deputy Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) directed by memorandum, dated 18 October 1977, that a "study be conducted to evaluate the capability of the Armed Services Vocational Aptitude Battery (ASVAB) to determine the reading ability skills of applicants for enlistment at the Armed Forces Examining and Entrance Stations (AFEESs)." It was believed that because of its highly verbal content, the ASVAB already indirectly measured reading ability. If that was, in fact, the case, most applicants with low reading skills were already being screened out. In addition, if a reading grade index could be derived from ASVAB, estimates of applicants' reading skills could be provided to Labor and HEW representatives involved in the programs alluded to above.

Thus, the specific objectives of this study were to assess the reading ability of applicants for military service, as well as for actual accessions, and to determine the relationship between ASVAB measures (Jensen, Massey, & Valentine, 1976) and reading scores. Depending on the magnitude of the relationship, an appropriate combination of ASVAB subtests could be used to estimate the reading grade level of groups of applicants and possibly to predict within a reasonable confidence interval the reading grade level of individuals. The present report concerns analyses involving two reading tests. Additional data covering two other reading tests will be presented in a subsequent report.

III. METHOD

Subjects

The study plan called for testing 6,000 service applicants divided among 25 geographically dispersed AFEESs. Four reading tests were administered, the Gates-MacGinitie, Nelson-Denny, Basic Skills Assessment, and Literacy Assessment Battery, with each subject taking two of the tests. This report concerns all subjects given the Gates-MacGinitie test and a subsample who were also given the Nelson-Denny test. In March–April 1978, 2,899 applicants were given the Gates-MacGinitie test, and ASVAB scores obtained for 2,432 of these. The first sample consists of 2,033 of the 2,432 for whom sufficient identification was available from reading and ASVAB data sources to obtain accurate matches and for whom most other data of interest (e.g., sex, race, education) were also valid. A subsample consists of 818 of the 2,033 who were given the Nelson-Denny reading test in addition to the Gates-MacGinitie. The second sample includes 212 subjects who took the Gates-MacGinitie and Nelson-Denny, but for whom no ASVAB data were available. Reading data for these was compared to that for the 818 to detect possible bias in the samples.

Predictors

An Applicant Processing Worksheet was available for most of the subjects. ASVAB subtest scores and Armed Forces Qualification Test (AFQT) percentiles were obtained from these documents. Other analysis variables from the worksheets included military service applied for, educational level, race, sex, and service qualification status–qualification being a function of an applicant's meeting specified minimum ASVAB and educational criteria. Sample percentages for demographic variables are in Appendix A.

Criteria

The reading tests involved in this report were the Gates-MacGinitie Reading Tests Survey D (Gates & MacGinitie, 1965) and the Nelson-Denny Reading Test Form C (Brown, Nelson, & Denny, 1976). The order of administration of these tests was counterbalanced. Both tests contain a vocabulary and a reading comprehension subtest which were separately scored. The published test norms were used to convert the reading test raw scores to reading grade level scores.

Statistical Method

Statistical analyses included multi-variate distributions and correlation matrices. Due to a difference in range and distributions, reading grade levels for the two reading tests have been summarized in most instances by use of medians rather than means. The best combinations of ASVAB subtests for predicting reading levels were determined via multiple regressions.

IV. RESULTS AND DISCUSSION

The percentages of service applicants scoring at each reading grade level as measured by the Gates-MacGinitie test are shown on the right side of Table 1. The reading grade level range of Gates-MacGinitie which is targeted at 4th–6th grades is from 2 to 11. The top reading grade level, labeled "11 & above," contains the largest proportion of applicants, 565 or 27.8% of 2,033. About 7.8% obtained reading grade levels below four. The median reading grade level of applicants was 9.0.

Due primarily to aptitudinal and educational screening standards employed by services, the reading grade levels of examinees meeting the qualification standards of the service for which tested were usually higher than those of examinees who did not qualify. The median reading grade level of applicants qualifying for services was 10.2 compared to 5.7 for non-qualifying applicants.

Table 1. **Percentages of Qualified and Not Qualified Applicants by Service at Each Gates-MacGinitie Reading Grade Level**

	Qualified					Not Qualified					All Applicants		
Reading Grade Level	Army	Navy	AF	MC	All	Army	Navy	AF	MC	All	RGL	%	N
11 & above	30.7	43.1	48.9	24.8	37.8	0.7	5.6	5.2	–	2.4		27.8	565
10–10.9	11.9	14.9	19.2	13.8	14..	5.2	5.6	12.9	3.5	7.1		12.3	249
9–9.9	10.2	10.0	12.9	15.2	11.2	3.1	7.0	9.7	3.5	5.4		9.5	194
8–8.9	8.6	10.1	6.9	11.0	8.9	6.6	9.9	7.7	6.9	7.3		8.5	172
7–7.9	9.8	9.4	6.3	13.1	9.3	7.6	11.3	14.8	10.3	10.3		9.5	194
6–6.9	11.1	5.5	1.9	9.7	7.3	12.4	16.9	13.6	8.6	12.9		8.9	180
5–5.9	9.8	3.7	1.9	6.9	6.0	21.0	12.7	14.2	17.2	17.8		9.3	189
4–4.9	5.2	1.8	0.6	1.4	2.8	15.9	16.9	12.6	22.4	15.7		6.4	131
3–3.9	2.1	1.4	0.6	2.8	1.6	13.8	9.9	6.5	8.6	10.8		4.2	86
2.9 & below	1.6	0.2	0.6	1.4	1.0	13.8	4.2	3.2	19.0	10.3		3.6	73
Total Percent	100	100	100	100	100	100	100	100	100	100		100	
Median Reading Grade Level	9.3	10.5	10.9	9.3	10.2	5.3	6.4	7.0	5.0	5.7	9.0		
Total N	561	436	317	145	1,459	290	71	155	58	574			2,033

Since each service has different screening standards and uses different combinations of abilities, the aptitude and education distributions vary across services for applicants and especially for accessions. This is reflected in relatively higher reading grade levels for Air Force and Navy applicants than for Army and Marine Corps applicants. As indicated in Table 1, the median reading grade level for applicants qualifying for the Air Force was 10.9 and the median reading grade level for those qualifying for the Navy was 10.5, while the median reading grade level for Army and Marine Corps qualified applicants was 9.3 each.

The impact of completion of high school on reading grade level can be seen in Table 2, which gives percentages of graduates and non-graduates at each reading grade level. The median reading grade level for

Table 2. **Percentage of High School Graduates and Non-Graduates at Each Gates-MacGinitie Reading Grade Level by Qualified/Non-Qualified**

	High School Graduate			High School Non-Graduate		
Estimated Reading Grade Level	Qualified	Not Qualified	All Grad	Qualified	Not Qualified	All Non-Grad
11 & above	42.9	3.7	34.3	30.3	1.5	20.0
10–10.9	15.8	6.7	13.8	12.0	7.6	10.4
9–9.9	11.0	5.4	9.8	11.6	5.5	9.4
8–8.9	7.6	8.7	7.8	10.8	6.1	9.1
7–7.9	8.1	12.4	9.0	11.1	8.8	10.3
6–6.9	4.7	15.3	7.0	10.8	11.0	10.9
5–5.9	5.0	14.9	7.2	7.0	19.8	11.6
4–4.9	2.5	16.1	5.5	3.4	15.5	7.8
3–3.9	1.6	9.9	3.5	1.7	11.6	5.3
2.9 & below	0.8	7.0	2.2	1.2	12.5	5.3
Total Percent	100	100	100	100	100	100
Median Reading Grade Level	10.6	6.1	9.8	9.3	5.5	7.9
Total N	855	242	1,097	584	328	912

high school graduates was 9.8 compared to 7.9 for high school non-graduates. The effect of aptitude screening on reading grade level is also evident from data in Table 2. High school graduates who qualified for services had a median reading grade level of 10.6 while high school graduates who did not qualify had a median reading grade level of 6.1.

The Armed Forces Qualification Test (AFQT), which is used for preliminary screening by all services, was correlated with the Gates-MacGinitie. The correlation (r) between AFQT percentiles and reading grade level was .74. For the Black applicants in the sample (N = 835), the r was .68 (race and sex distributions of reading grade level appear in Appendix B). To gauge the magnitude of this relationship, the construct validity and reliability of the Gates-MacGinitie and the reliability of AFQT must be considered. Due to less than perfect reliability of these measures, their maximum intercorrelation would be less than one.

Data for a subsample of the 2,033 who had also taken the Nelson-Denny reading test (N = 818) was analyzed for additional information. The 818 appeared to be representative of the 2,033, with mean Gates-MacGinitie reading grade levels of 8.6 and 8.4, respectively, and a common Standard Deviation of 2.8.

The Nelson-Denny has a reading grade level range of from 6 to 15 and is targeted at about the 11th–13th grades. Table 3 contains comparable data for samples for which Gates-MacGinitie and Nelson-Denny data were analyzed. The median reading grade level for Nelson-Denny was 9.5 compared to 9.0 for Gates-MacGinitie. While 32.4% of applicants had Gates-MacGinitie reading grade levels of six or less, only 10.8% of applicants had Nelson-Denny reading grade levels of six or less. The mean AFQT percentile of those with reading grade levels of six or less was 25.5 for Gates-MacGinitie and 31.9 for Nelson-Denny. The correlation between Nelson-Denny reading grade level and AFQT was .65 compared to the r of .74 between Gates-MacGinitie and AFQT (intercorrelations of reading tests, AFQT, and selected ASVAB subtests are listed in Table 4). The r between the average of Gates-MacGinitie and Nelson-Denny reading grade levels and AFQT was .76.

Table 3. **Comparison of Reading Grade Level and AFQT for Gates-MacGinitie (N = 2,033) and Nelson-Denny (N = 818) Samples**

	Cumulative %		AFQT Mean			
Reading Grade Level	Gates-MacGinitie	Nelson-Denny	Gates-MacGinitie		Nelson-Denny	
15 & above	–	100	–		81.9	
14–14.9	–	94.8	–		76.0	
13–13.9	–	88.1	–		64.5	(66.9)[b]
12–12.9	–	78.7	–		57.5	
11–11.9	100	70.1	70.9		60.8	
10–10.9	72.2	63.9	55.1		49.6	
9–9.9	59.9	55.0	50.9		46.9	
8–8.9	50.4	42.4	46.4		40.4	
7–7.9	41.9	27.7	38.8		38.2	
6–6.9	32.4	10.8	32.0		31.9	
5–5.9	23.5	–	28.9		–	
4–4.9	14.2	–	22.7	(25.5)[a]	–	
3–3.9	7.8	–	18.3		–	
2.9 & below	3.6	–	14.2		–	
Median Reading Grade Level	9.0	9.5				
AFQT Mean			47.2		50.1	
Standard Deviation			23.7		22.5	
Total N	2,033	818				

[a]Mean for 6 and below.

[b]Mean for 11 and above.

Table 4. **Means, Standard Deviations, and Intercorrelations of Variables for Gates-MacGinitie + Nelson-Denny Subsample**
(N = 818)

Variable	Mean	SD	Intercorrelations												
			1	2	3	4	5	6	7	8	9	10	11	12	13
1 Sex[a]	1.16	.37	1.00	−.01	.20	.10	.11	.19	.14	.02	−.11	.04	.15	.20	.19
2 Race[b]	1.43	.55	−.01	1.00	.02	−.37	−.38	−.30	−.34	−.35	−.22	−.37	−.40	−.40	−.44
3 Education Level	11.58	1.27	.20	.02	1.00	.28	.29	.25	.30	.24	.06	.31	.23	.36	.32
4 AFQT Percentile	50.06	22.52	.10	−.37	.28	1.00	.94	.57	.88	.82	.62	.73	.74	.65	.76
5 GT Percentile	54.33	27.20	.11	−.38	.29	.94	1.00	.58	.94	.83	.38	.68	.76	.69	.79
6 NO	30.56	10.19	.19	−.30	.25	.57	.58	1.00	.49	.58	.28	.49	.58	.59	.64
7 WK	18.63	6.71	.14	−.34	.30	.88	.91	.49	1.00	.62	.33	.71	.73	.69	.78
8 AR	11.47	4.30	.02	−.35	.24	.82	.83	.58	.62	1.00	.40	.58	.60	.54	.62
9 SP	12.06	3.92	−.11	−.22	.06	.62	.38	.28	.33	.40	00	.43	.39	.25	.35
10 GS	10.31	3.91	.04	−.37	.31	.73	.68	.49	.71	.58	.43	1.00	.70	.67	.74
11 Gates-MacGinitie Reading Grade Level	8.60	2.82	.15	−.40	.23	.74	.76	.58	.73	.60	.39	.70	1.00	.69	.92
12 Nelson-Denny Reading Grade Level	10.09	2.73	.20	−.40	.36	.65	.69	.59	.69	.54	.25	.67	.69	1.00	.92
13 Average Reading Grade Level[c]	9.37	2.55	.19	−.44	.32	.76	.79	.64	.78	.62	.35	.74	.92	.92	1.00

[a]Male = 1, Female = 2.

[b]Caucasian = 1, Minority = 2.

[c]Average of Gates-MacGinitie and Nelson-Denny Reading Grade Levels for each subject.

The intercorrelation between Gates-MacGinitie and Nelson-Denny reading grade levels was .69. If these tests are measuring the same ability (reading), then AFQT is also measuring reading with comparable precision since AFQT correlates to about the same degree with Gates-MacGinitie and Nelson-Denny as these reading tests do with each other.

AFQT is not the best ASVAB measure of either reading grade level, however. Not surprisingly, the ASVAB subtest with the highest relationship to reading scores was Word Knowledge (WK). This vocabulary test correlated .73, .69, and .78 with Gates-MacGinitie, Nelson-Denny, and the average of the two reading grade levels, respectively. Of the other two subtests (besides WK) which form the AFQT, Arithmetic Reasoning (AR) correlated substantially higher with reading grade level than did Space Perception (SP). The *r* between AR and average reading grade level was .62, compared to .35 between SP and average reading grade level. This indicates that a composite of WK and AR (the General Technical composite used by Army and Navy, and the General Aptitude Index (AI) composite used by Air Force) would be an even more valid predictor of reading grade level than AFQT. The General Technical composite (GT) correlated .76, .68, and .79 with Gates-MacGinitie, Nelson-Denny, and average reading grade levels, respectively. Compared to the *r* of .76 between AFQT and average reading grade level, GT accounts for about 5% more variance in reading grade levels than does AFQT.

Based on multiple correlations (Rs), the best two ASVAB subtest combination for predicting both reading tests consisted of WK and Numeric Operations (NO), a clerical speeded subtest. The R's of WK and NO were .77, .75, and .83 with Gates-MacGinitie, Nelson-Denny, and average reading grade levels, respectively. The three ASVAB subtest combination which correlated highest with reading grade levels included General Science (GS). The R's of WK, NO, and GS with Gates-MacGinitie, Nelson-Denny, and average reading grade level were .80, .77, and .86.

The choice among commercial reading tests and some combination of ASVAB measures as optimal for estimating reading grade levels of service applicants should be based on considerations involving fairness, difficulty levels, and administrative considerations as well as validity and reliability. The reading tests (Gates-MacGinitie + Nelson-Denny) correlated slightly higher with race than did AFQT (−.44 vs. −.37). Minorities did relatively less well on both reading tests than they did on AFQT. Gates-MacGinitie plus Nelson-Denny also had a higher *r* with the dichotomous variable sex than did AFQT (.19 vs. .10). Females scored higher on both AFQT and reading tests, but this sex difference was less on AFQT.

Regarding difficulty levels, the form of Gates-MacGinitie used would be appropriate for minimum cutoff scores around 4th–6th reading grade levels. However, Gates-MacGinitie would be too easy for cutoffs at the 9th reading grade level (used by the Air Force) or for accurate estimates of group reading grade levels since the median of service accessions was only one grade lower than the top Gates-MacGinitie reading grade level. The Nelson-Denny form used would be too difficult for use for cutoffs around the 4th–6th reading grade levels since the sixth grade was the lowest Nelson-Denny reading grade level. The ASVAB was developed for the service applicant population. The mean item difficulty level (proportion of examinees correctly answering items) is about .6 on AFQT and GT (uncorrected for guessing).

From an administrative standpoint, the easiest way to obtain estimates of reading grade level would be currently used ASVAB composites (AFQT or GT). An unweighted combination of ASVAB subtests (such as WK + GS + NO) would be somewhat less convenient and probably not much more valid. A weighted composite of WK + GS + NO would give a somewhat better estimate of reading grade level, but would require additional computations. A reading grade level index computed from ASVAB could be used to tailor basic skills remediation programs to the reading levels of their referrals.

The sample of 818 taking the Gates-MacGinitie and Nelson-Denny tests was compared to 212 who also took these tests but for whom no ASVAB data were available. It had been speculated that many of those without ASVAB data were of marginal aptitude and did not return to take the ASVAB after doing poorly on the reading tests. This was not the case, however, as the mean average reading grade level was slightly higher for the 212 than for the 818 (9.8 vs. 9.4).

V. CONCLUSIONS

The main findings of this study were:

1. The median reading grade level for service applicants was 9.0 based on Gates-MacGinitie and 9.5 based on Nelson-Denny. The median Gates-MacGinitie reading grade level of applicants who qualified for services was 10.2 compared to 5.7 for non-qualified applicants.

2. The AFQT correlated .74 with Gates-MacGinitie, .65 with Nelson-Denny, and .76 with average reading grade levels, respectively. Since the intercorrelation of Gates-MacGinitie and Nelson-Denny was .69, AFQT appeared to measure reading as well as the reading tests. The GT composite (General Aptitude Index (AI) for Air Force) correlated .79 with average reading grade level.

3. The multiple correlations between the three ASVAB subtest combination of WK, GS, and NO, and the Gates-MacGinitie, Nelson-Denny, and average reading grade levels were .80, .77, and .86, respectively.

4. ASVAB is presently screening out most applicants with marginal literacy skills.

VI. RECOMMENDATIONS

The GT composite of ASVAB should be used as an index of reading grade level. A conversion table can be developed for predicting reading grade levels from GT scores.

REFERENCES

Brown, J.I., Nelson, M.J., & Denny, E.C. *The Nelson-Denny Reading Test.* Examiner's Manual. Boston, MA: Houghton Mifflin Company, 1976.

Gates, A.I., & MacGinitie, W.H. *Gates-MacGinitie Reading Tests, Survey D,* Teacher's Manual. New York: Teachers College Press, 1965.

Jensen, H.E., Massey, I.H., & Valentine, L.D., Jr. *Armed Services Vocational Aptitude Battery Development (ASVAB Forms 5, 6, and 7).* AFHRL-TR-76-87, AD-A037 522. Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, December 1976.

APPENDIX A: FREQUENCY DISTRIBUTIONS OF VARIABLES FOR GATES-MACGINITIE SAMPLE (N = 2,033) AND NELSON-DENNY SUBSAMPLE (N = 818)

Category	Gates-MacGinitie Sample		Gates-MacGinitie + Nelson-Denny Subsample	
	N	%	N	%
Service				
Army	851	41.9	371	45.4
Navy	507	24.9	187	22.9
Air Force	472	23.2	195	23.8
Marine Corps	203	10.0	65	8.0
Race				
White	1,198	58.9	508	62.1
Black	835	41.1	310	37.9
Sex				
Male	1,652	81.3	688	84.1
Female	381	18.7	130	15.9
Qualified Status				
Qualified	1,459	71.8	645	78.9
Not Qualified	574	28.2	173	21.1
AFEES				
Atlanta	273	13.4	273	33.4
Boston	27	1.3		
Cincinnati	175	8.6		
Dallas	271	13.3	271	33.1
Fresno	89	4.4		
Indianapolis	196	9.6		
Jacksonville	35	1.7		
New Orleans	193	9.5		
Oklahoma City	189	9.3	189	23.1
Philadelphia	446	21.9		
Pittsburgh	85	4.2	85	10.4

APPENDIX B: PERCENTAGES OF APPLICANTS AT EACH GATES-MACGINITIE READING GRADE LEVEL BY RACE AND SEX

Reading Grade Level	White	Black	Male	Female
11 & above	38.8	12.0	26.3	34.4
10–10.9	15.4	7.8	11.6	15.2
9–9.9	10.9	7.7	9.0	12.1
8–8.9	8.4	8.5	8.2	9.7
7–7.9	7.9	11.9	9.4	10.0
6–6.9	6.8	11.9	9.4	6.6
5–5.9	4.9	15.6	9.8	7.4
4–4.9	3.2	11.1	7.4	2.4
3–3.9	2.3	7.1	4.8	1.8
2.9 & below	1.5	6.6	4.3	0.5
Total percent	100	100	100	100
Median Reading Grade Level	10.3	6.8	8.6	10.0
Total N	1,198	835	1,652	381

☆U.S. GOVERNMENT PRINTING OFFICE:1979- 671-056/96